STATE OF SOME OF THE LONDON ROADS.

The infamous condition of parts of the New-road, and general bad condition of many of the metropolitan roads known more particularly as macadamised roads, is to be referred to the total want of anything in the shape of science displayed in their construction or reparation. What is put on one week is scraped off the next*: the result is lavish expenditure and imperfect roads; to say nothing of the wear and tear of horses and vehicles (no small consideration), resulting from the barbarous plan adopted of shooting broken pieces of angular granite upon the road, and leaving their ultimate consolidation a matter of accident. That roads should be made ready for traffic, and not left for traffic to make them, is, I take it, a first principle.

1. The surface of the road should present a flat ellipse: this tends to keep the road dry, and allows the sun and wind to have a greater effect in evaporation.

2. The entire road formation should not be less than 2 feet 6 inches in depth.

3. The whole should be drained, and form one cemented mass.

4. The upper surface should be dressed with the hardest stone, such as basalt or granite, in cubes not exceeding 2½ inches, grouted together, and left to consolidate.

A District Surveyor.

*** And then, when all this has been effected, the water company's men will come and destroy it for you; and, as soon as the damage done by them has been patched up, a new gas company, or the Commissioners of Sewers, will probably find it necessary to walk in and disturb once more the road's equanimity.—Ed.

TESTING THE EXHIBITION BUILDING.

Sir,—Will you permit me to say that the mode of testing the gallery floor last week, concerning which so much was said by the papers, is to my mind far from satisfactory, inasmuch as the inclined planes at each end of the beams formed struts to them, and converted the whole into a species of Queen-truss. I have no doubt that *the beams* are strong enough for their work, and so far as I know no question has ever been expressed with respect to them; but, Sir, the parts of the construction that have been objected to—viz. 1, *the insufficiency of the diameter of the columns*, causing inability to resist lateral pressure; and 2, *the insufficiency of the connections* of the beams with the columns, do not appear to have been tested at all; the model floor having been placed at a height of some 12 or 14 inches from the ground, leaving completely untouched the questions above alluded to, and besides not experiencing the vibration which there is in the real galleries 30 feet from the ground. Possibly the parts in question have been tested, though not in a public manner: if so, I shall be glad if this letter produce a reply to that effect.—B.

*** We received many letters on this subject last week, but avoided noticing them, not desiring to seem always in collision with those who have the conduct of the structure. We need not tell our readers any more than the parties themselves that the trial proved very little. We feel no surprise, like some of our correspondents, that the directors of the work made the experiment in question as a first step, but quite participate in their astonishment that it should be trumpetted far and wide through the press as a test of any value.

Architects' Benevolent Society.—We would direct our readers' attention to the announcement elsewhere, that the annual general meeting of this society will be held at the Freemasons' Tavern, on the 12th instant, when the chair will be taken at 3 o'clock.

Lambeth Ragged Schools.—The schools erected in Lambeth by the munificence of Mr. Beaufoy (and to which we have on other occasions alluded), were publicly opened on Wednesday last. We shall pay them an early visit.

* Chalk, lime, and fine gravel might be worked in; at present there are no binding ingredients.

CONSTRUCTION OF THE BORDER BRIDGE OVER THE TWEED.

INSTITUTION OF CIVIL ENGINEERS.

On February 25, Mr. William Cubitt, President, in the chair, the paper read was "A Description of the 'Royal Border Bridge,' erected over the River Tweed, on the line of the York, Newcastle, and Berwick Railway," by Mr. G. B. Bruce.

This viaduct, the total length of which is 2,160 feet, and the extreme height 129 feet, consists of twenty-eight semi-circular arches, each 61 feet 6 inches span; and the whole is constructed of stone, with the exception of the inner part of the arches, which is of brick laid in cement. It is divided into two parts by a central abutment, which enables the land arches to be completed, and, along with a temporary timber bridge, to be brought into use for public traffic, before the completion of the river arches, which necessarily occupied a considerable period in execution, owing partly to very substantial coffer-dams having been requisite for the river piers, but principally to its having been thought advisable to pile the foundations of most of these piers, as the bed of the river was liable to be scoured away by the rapid stream. The piles, both of the coffer-dams and of the foundations, are mostly of American elm, as it was found that the heads of the Memel piles required to be frequently cut off and re-hooped, when driven by Nasmyth's steam pile-driver, which was almost entirely used, both on account of expedition and of economy; for it was proved, that whilst the hand ram only gave one blow in four minutes, the steam pile-driver gave sixty blows in one minute, and that the cost of the former was two shillings per lineal foot, whereas that of the latter was very little more than one shilling per lineal foot. It was also remarked, that the force was more advantageously employed in the case of the steam pile-driver, as, on account of the ram being heavier and the fall less, the piles were not so frequently split.

The piers had an ashlar facing, and were filled in with well grouted rubble, having occasional through courses of ashlar, and an ashlar tie in the centre of their width from top to bottom. Great care, it was said, was taken in the preparation of the mortar and the grout used in this work, and after a variety of experiments, the plan finally adopted was,—in the case of setting lime for ashlar,—to grind quicklime dry by itself, in a common mill, and then to mix it with coarse, sharp sand, screened out of gravel taken from the bed of the river, in the proportion of three of sand to one of quicklime: this was then put under cover until required. Lime to be used for grout was also ground dry, and along with it was ground slag from an iron furnace, then gravel from the river was mixed with it without being screened, the proportions being quick lime one,—slag three quarters,—and gravel two and a quarter. The mortar when used had absorbed a sufficient quantity of moisture from the atmosphere and the sand, to prevent its being too hot for use; and yet, as it had not been previously mixed with water and wrought into a paste, it retained its original setting power. This mortar required to be used very soft, and the stones to be well wetted, and as the sand was very coarse, thick joints were necessary, but in a few weeks it set as hard as Roman cement. All the lime used in this work was from the mountain limestone of the Scremerston and Lowich districts of Northumberland.

The centres, which were stated to have been of peculiar construction, were supported entirely from the piers, so as to prevent any accident happening, if the scaffolding were injured, either by the heavy floods of ice to which the river Tweed is subject in winter, or from the vibration caused by passing trains; as, when the idea was first entertained of having a temporary bridge, the intention was merely to add to the contractors' scaffolding, and to make it serve for both purposes. This intention was, however, abandoned, and an entirely separate timber bridge was erected, on the east side of the stone bridge, at a cost of 14,340*l*.

The total cost of the "Royal Border Bridge" was 120,000*l* and of the whole contract, one mile in length, in which it was comprised, 207,000*l*. including an embankment, which had to be made entirely from side cutting, and which contained probably 760,000 cubic yards.

SEYSSEL ASPHALTE AT WOOLWICH.

At the Royal Carriage Department, Woolwich, the authorities are working early and late to get the many alterations effected by the period of opening the World's Fair. Messrs. Fox, Henderson, and Co., are employed to do the extensive range of iron and glass roofs, and the Asphalte of Seyssel Company have contracted for the roadways through the several streets. In the application of this material a railway and engine are employed, which, running under the iron roofs above named, give the place the appearance of a railway-station.

DRAWING WATER FROM LONG DISTANCES.

The question put by your correspondent as to the capabilities of a suction-pump for fetching water upon a level a distance of 800 feet is, I think, worthy a few practical remarks, which I would respectfully place at the disposal of The Builder.

Water and all fluids, like every other gravitating medium, when put in motion, are subject to the operation of two influences—inertia and momentum; and these forces operate upon all qualities of matter in the ratio of their relative specific gravities. Iron bears to water a proportion of about 7 to 1; therefore, it will take the same intensity of a force to overcome the inertia of a column of water 800 feet as it would a bar of iron about 115 feet long, whether such motion be horizontal or vertical. So also with regard to the momentum of the mass when in motion. Now, to start this bulk of water and stop it again *instanter* at every stroke of the pump is a perfect impossibility: it must have time, and this periodic duration becomes greater as the column of water gets longer, irrespective of its diameter. If a pump be worked at a *maximum* speed, and the water have to be fetched a great distance, this period of time becomes very perceptible; and hence the difficulty which arises even in fetching it at all, without resorting to other means. Take an instance. We want to fetch water 800 feet, say. Put down an ordinary suction-pump used for general purposes: it will not fetch the water at all. Increase the size of the pipes, the result will be little better. Double the size of the pump, or make it double-acting, or put two pumps working opposite: drive any of these at half the original velocity, and we shall gain something towards fifty per cent.; and, after all, the pump will work very imperfectly. And why? because the water has not time to start and stop its motion throughout the whole length of the pipes the instant the pump-bucket changes the direction of its motion. Hence a shock at each extremity of the stroke, one caused by inertia before the water begins to move, and the other produced by the momentum of the mass of water when it is in motion. The result is, the water is always too late: it will not start with the plunger, and thus the pump works imperfectly with much noise and labour, and under serious disadvantage. To take a real case. A 5-horse engine, working two single-acting pumps in opposite connection is required to fetch water at an "effective speed" a distance of about 60 feet. As long as the pumps work slowly, all is right; but the moment they get above a certain tardy velocity, the delivery of water becomes imperfect, and a series of percussive shocks in the suction-pipes and machinery at once commences. The vacuum in the pipes necessary to balance the depth of water in the well becomes doubled at the commencement of every stroke: the plunger ascends, but the water has not time to fill up the space left: hence at every return-stroke there is a severe shock, because the pump's motion is opposite to that of the water. Thus an accumulation takes place, and the *vacuum* that existed an instant ago in the suction-pipes, is now a *pressure* of 10 to 12 lbs. per inch.